

WHAT IS CLAIMED IS:

1. A method for fabricating a nanowire thermoelectric device comprising the steps of:
 - providing a substrate upon which to grow nanowires;
 - forming a first electrode pattern on the top surface of the substrate, wherein the first electrode pattern comprises bottom electrodes and a first set of connections, which connects the bottom electrodes to form first and second groups of electrically connected bottom electrodes;
 - forming a p-type nanowire on the substrate by activating the first group of electrically connected bottom electrodes during p-type material electrodeposition;
 - forming a n-type nanowire on the substrate by activating the second group of electrically connected bottom electrodes during n-type material electrodeposition;
 - forming top electrodes to connect the p-type nanowire to the n-type nanowire;
 - forming a first set of holes in the substrate to remove the first set of connections between the bottom electrodes;
 - forming a second set of holes in the substrate to allow for electrical access to the bottom electrodes; and
 - forming a second bottom electrode pattern, wherein the second bottom electrode pattern comprises the bottom electrodes and a second set of connections between the bottom electrodes, and wherein the second bottom electrode pattern is formed using the second set of holes.

2. The method for fabricating a nanowire thermoelectric device according to Claim 1, wherein the holes are keystone shaped.

3. The method for fabricating a nanowire thermoelectric device according to Claim 1, further comprising the steps of disposing a nanopore formation layer on the substrate and forming nanopores in the nanopore formation layer after the nanopore formation layer is disposed on the substrate.

4. The method for fabricating a nanowire thermoelectric device according to Claim 3, wherein the nanopores in the nanopore formation layer are registered to the bottom electrodes.

5. The method for fabricating a nanowire thermoelectric device according to Claim 3, wherein the nanopore formation layer comprises Al and anodic oxidation is used to create nanopores within the nanopore formation layer.

6. The method for fabricating a nanowire thermoelectric device according to Claim 5, wherein the nanopore formation layer is removed prior to completion of the thermoelectric device.

7. The method for fabricating a nanowire thermoelectric device according to Claim 6, wherein the nanopore formation layer is not removed until after the second electrode pattern is formed.

8. The method for fabricating a nanowire thermoelectric device according to Claim 1, wherein either the p-type nanowire or the n-type nanowire is formed prior to the formation of another type of nanowire.

9. The method for fabricating a nanowire thermoelectric device according to Claim 1, wherein many thermocouples are formed and are connected in series and/or parallel by the second bottom electrode pattern.

10. The method for fabricating a nanowire thermoelectric device according to Claim 9, wherein the thermocouples form banks of series connected thermocouples and the banks of series connected thermocouples are connected in parallel.

11. The method for fabricating a nanowire thermoelectric device according to Claim 1, further comprising the steps of encapsulating the substrate and nanowire thermocouples to form a nanowire thermoelectric module,
and creating a vacuum around the nanowires.

12. A nanowire thermoelectric device comprising,
a substrate, bottom electrodes, a p-type nanowire, a n-type nanowire, a top electrode pattern, and a bottom electrode pattern,
wherein the bottom electrode pattern is formed in channels within the substrate.